

## Ceramics Notes

Ceramics is the art of making pottery or working with clay. Clay is naturally formed by the erosion or breaking down of the earth's surface. Found worldwide it is primarily made up of hydrated silicates of alumina. This is why raw clay can be found in creek beds and wet areas. Clay is plastic in nature and can easily be molded into forms. Blended clays are known as clay bodies.

In choosing a clay body, there are three basic considerations: *Firing Temperature, Texture, and Color & Glaze Response.*

### Firing Temperature

Earthenware Clay bodies ---Cone 06-3 1850-2000°F/1000-1160°C

Mid Range Clay bodies ---Cone 4-7 2160-2260°F/1160-1225°C

High Fire Clay bodies ---Cone 6-10 2200-2400°F/1200-1300°C

### Texture

Texture refers to the "feel" or "tooth" of the clay, which is achieved by the addition of coarse ground fireclays, sand, or grog. Potter's usually prefer their wheel throwing clay to be smoother than their sculpture clay. This is simply a matter of preference, as wheel and sculpture clay can be used interchangeably by many potters.

### Color & Glaze Response

Terra Cotta has a beautiful natural reddish-brown color, which is often times left unglazed. Other clays, such as porcelain, can be colored by adding oxides or stains. Every colored clay will cause a different glaze response. If you are looking for the truest color response from a glaze, choose a white firing clay.

### TYPES OF CLAYBODIES:

Clay bodies are made up of many different kinds of clay, however some of the most common clay bodies are:

**Earthenware:** Low fire clay that is usually reddish brown, gray, or white in color. It works well with throwing on the wheel and hand building because it is smooth and porous. This is what we will be using during ceramics.

**Stoneware:** Higher firing clay than Earthenware, in the middle range, porous clay that can be used for hand building and throwing. This is usually groggier than Earthenware clay. It is a little more expensive and glazes are harder to control. Some stoneware clay bodies as well as glazes work better fired in a gas kiln to reach higher temperatures.

**Porcelain:** Middle range to high range of firing, smooth in texture, and white in color. This type of clay works better with wheel thrown or casted from a mold, but because the clay body is so thin it is very hard to work with on the wheel. This clay body is also much more expensive.

**Fire Clay:** Highest firing clay commonly used for insulating brick, hard firebrick, and kiln furniture. Firing of this clay takes a special gas kiln.

**STAGES OF CLAY:**

Before you can have a finished clay project, the body of clay must go through the following 5 stages slowly to mature the clay.

**STAGE #1 - GREENWARE:** Clay that has not been fired. In this stage clay can always be melted down and re-worked for usable clay. In the greenware stage as clay begins to dry out it goes through 3 stages before the clay body can be fired.

**Wet Clay:** In this stage clay can be easily manipulated and formed.

**Leatherhard:** In this stage the clay begins to dry out, leaving the body flexible and tough. As the clay dries out, you will notice the color turn lighter. You can't easily smooth pieces of clay together, however you may use the slip and score method. It may be easier to work with larger pieces once they have dried out a little.

**Bone Dry:** In this stage, clay is much more fragile as the moisture is drawn out of the clay body. Piece can easily break, especially if not properly attached. You will not be able to attach pieces back together once the piece is completely dried out. When the clay piece feels room temperature it is ready for the first fire.

Once your piece is bone dry follow this procedure:  
Sand or smooth your piece as well as sign or initial it. Place it on the table by the kiln to be fired.

**STAGE #2 - BISQUE FIRE:** The first fire your piece will go through, roughly about 1900 degrees at the hottest point it will mature and harden the clay body. This fire takes roughly 24 hours from start to finish as it slowly heats and cools your piece.

**STAGE #3 - BISQUE WARE:** Ware that has been bisque fired and ready to be painted or glazed.  
Once your piece has been fired, paint it with acrylic paint to be finished or glaze it to be fired again. Acrylic painted ware does not get re-fired, the piece is done once the paint dries. Be sure to follow all glazing and painting procedures.

**STAGE #4 - GLAZE FIRE:** The second and last fire your glazed piece will need to go through. This fire is a little cooler, about 1600 degrees yet still hot enough to melt and fuse the glass silicates in the glaze. This fire also takes about 2 days before the ware is cool enough to safely unload the kiln.

**STAGE #5 - GLAZE WARE:** Fired glazed ware.

**PARTS OF A POT:**

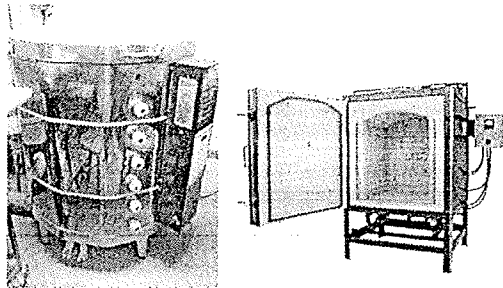
**Lip / Rim:** The top of your piece, sometimes distinct and different from the rest of the piece.

**Belly:** The main body of the piece, which could be used to hold something.

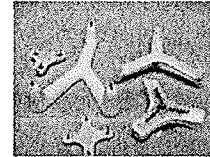
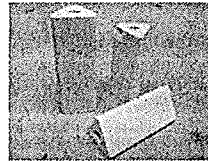
**Foot:** The base of the piece, usually a ring like base on a wheel thrown piece formed by tooling excess clay.

**OTHER TOOLS AND SUPPLIES****Kiln:**

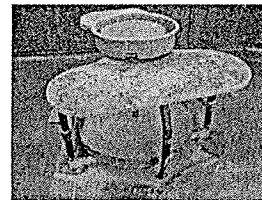
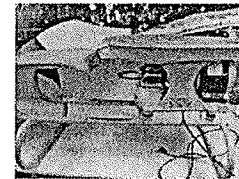
Without a kiln, pottery is hardly pottery. A kiln bakes or "fires" pottery at very high temperatures to harden the clay and melt the glaze onto the surface of the pottery. Kilns vary greatly in size, and several types are available. Some kilns are intended to fire only very small jewelry pieces. These kilns are only several inches large and are almost always electrically operated. Other kilns are as large as entire rooms and used for industrial ceramic producers. These huge kilns are operated electrically, with fire or with gas. Occasionally, people will fashion an outdoor kiln. These are inexpensive kilns that are placed over a fire and used to create interesting patterning caused by the unharnessed fire. Other primitive firing methods such as pit firing are still in use today for more decorative pieces.

**Kilns:**

Kiln furniture, made from fireclay, is very fragile and expensive to replace.

**Pottery Wheel:**

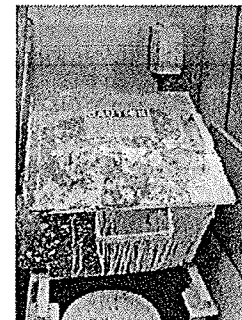
To make perfectly symmetrical pottery pieces, it is important to use a pottery wheel. Pottery wheels come in two main varieties: electric and kick wheel. Electric pottery wheels are controlled with a switch or a pedal, much like a sewing machine. This year you will be using the pottery wheel to form many of your pots. Pieces that aren't made with the use of a pottery wheel are called hand-built instead of wheel thrown ware. The term "throwing on the wheel" comes from the old English word "Thrawan" which means a twisting or spinning action, which creates an end product.

**Kick Wheel****Electric Wheel****Wedging Board:**

This metal framed box is filled with plaster to allow clay to be wedged on. The plaster absorbs some of the moisture out of the clay during the wedging process, so it is a good idea to wedge clay that is a little moister than you would like to use. On one side a canvas mat covers the plaster to allow for more absorption while wedging extra wet clay. A metal wire is attached to the base and top of the board to allow potters to cut the clay in half to check for air bubbles.

**Clay Mixer:**

The clay mixer is intended to re-mix clay from scraps to save on time, energy and money. Wet scraps are combined with dry powdered clay to mix into moist clay for you to use. This is a nice piece of equipment, but also contains very sharp blades that mix up the clay. Students are not allowed to operate or get clay out of the mixer. I will mix up the clay and empty the mixer.



**Scrap-buckets:**

Scraps of "Unfired" clay only go into the scrap buckets. Do not put any other materials (paper towels, pencils, clay tools, etc) into the scrap bucket, as scraps will be made into workable clay. Bone-dry clay will melt down in the watery slip. If you ever need any clay slip, this would be a good place to get some.

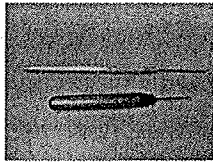
**Clay Barrel**

We use this rather large garbage can to hold good, useable clay to work with for Ceramics class. To insure that the clay stays moist, put the garbage sacks back in the bucket on top and make sure the lid is on tight. Only put soft moist clay back in this bucket if you want "good" clay to work with. If clay scraps are too dry or too wet from wheel throwing, put them in the scrap buckets.



## Smaller Clay Tools

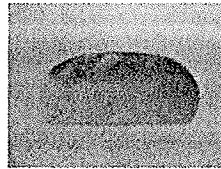
**Needle Tool:** The sharp needle is firmly set in aluminum handle, which is finely textured to provide a firm grip for wet hands. This tool may be used to cut heavy clay strips, to cut designs in clay, and to put holes in clay.

**Cut off wires or Toggle Cutters:**

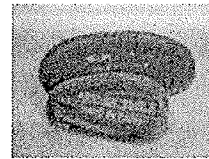
This tool is used for slicing and cutting lump clay. It also works well for cutting pots and other items off of the bat after thrown on the wheel. Harwood 3" toggle handles are firmly fastened to approximately 18" of fine quality stainless steel.

**Metal Scraper or Rib:**

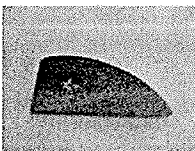
This tool is used for shaping, smoothing, and trimming pottery shapes. These are made from thin, flexible spring stainless steel.

**Rubber Scraper or Rib:**

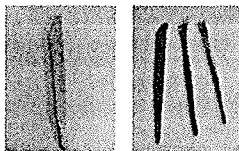
This kidney shaped rubber tool is used for smoothing, shaping, and finishing pottery pieces.

**Wooden Rib:**

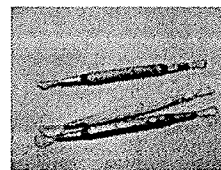
This tool is made from smooth-finished, imported hardwood. This type of tool is used to employ the basic shapes required for opening, shaping, curving, smoothing, and trimming wet clay on the potter's wheel.

**Modeling Tools:**

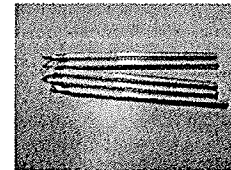
Handcrafted tools are made from wood where as molded ones are made out of plastic. They are used for cutting, slicing, smoothing, contouring and pattern decorating in soft clay.

**Ribbon Tools:**

These tools come in different shapes and sizes for light cutting, trimming, and slicing. The ends are formed from clock-spring steel and are firmly attached to the handles with brass ferrules.

**Ribbon Sculpting Tool Set:**

These miniature sculpting tools are made of fine ribbon steel treated for maximum strength and are just the answer for fine sculpting, detailing, and trimming.

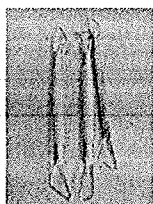


**Loop Tools:**

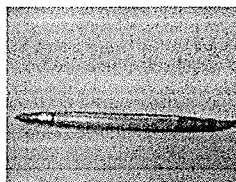
These tools are used to remove larger controlled amounts and shapes of clay from wheel thrown pieces and clay sculpture pieces. The shaped cutting heads are made from heavy stainless steel ribbon with sharpened edges. Rugged hardwood handles provide a sure grip and allow easy manipulation of these tools in wet clay or leather-hard clay.

**Double Wire End Tool:**

A double wire tool that is made from high-strength stainless steel is firmly attached to hardwood handles with brass ferrules. Designed for medium duty cutting and slicing of clay as the edges are more rounded and blunt.

**Eraser / Wipe Out Tool:**

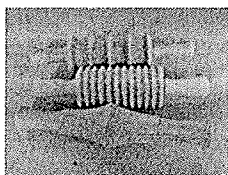
Soft rubber tip at both ends makes this tool easy to smooth and get into tiny spaces on your wet clay or leather-hard clay piece.

**Rolling Pin or Clay Rollers:**

Clay is quickly and easily rolled to the proper thickness with this tool. Made with either 2 wooden handles on both sides or one metal handle, both rollers are made from smooth hardwood.

**Decorative Rolling Pins:**

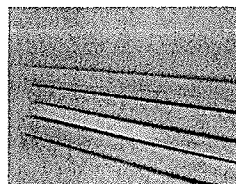
Wooden rolling pin tool, that works well for imprinting designs into clay projects.

**Bisque Fired Clay Stamps:**

These fired clay stamps work well for imprinting designs into your clay pieces. You can easily design your own by carving, pressing, molding clay into something. Once fired then you can either press clay into the stamp and pull out to add to a piece or use the stamp to press it onto a larger piece.

**Wood Strips:**

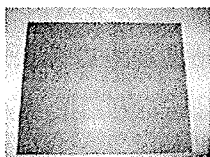
Clay thickness strips for rolling uniform thickness slabs of clay. Strips made from kiln dried wood. 24 inches long strips vary in size thickness from 1/8", 1/4", 3/8", and 1/2".

**Greenware File:**

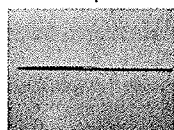
A lightweight, flexible and washable file is an easily held tool for cleaning ceramic and porcelain greenware as well as wet cleaning low fire porcelain. Its flexibility allows the tool to follow the contour of the greenware for cleanly finished pieces and the coarse side of the tool will take down seam lines. It will also remove most gouges and pits.

**Drywall Sandpaper:**

Silicon carbide mesh cloth not only works well for sanding drywall but for clay as well. The open whole square design makes it tough for even clay to clog. For best results use only on bone-dry ware with a light touch.

**Jeweler's File:**

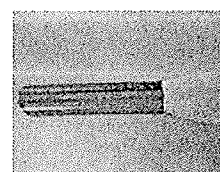
This metal file allows ceramists to file small areas of a bisque fired or glazed fired piece. For ceramics, this tool works best for widening holes of bisque fired ware. Be careful when using this tool, as a bisque fired piece is very fragile and shards of broken ware can be sharp.

**Camelhair Brush:**

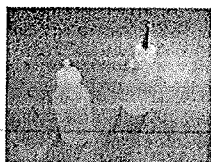
This tool is made out of natural fine camel hair and used for the application of glaze on a bisque fired clay piece.

**Multi-stem Japanese Hake Brush:**

This brush allows you to put a lot of glaze on evenly on your piece at one time before it dries.



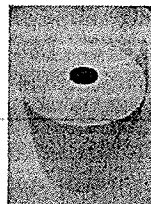
**Slip or Glaze Trailing Bottle:**  
This easy to squeeze container is used by potters and ceramists to trail slips and glazes into tiny areas.



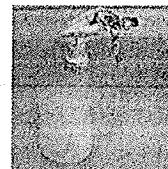
**Plastic Bag:**  
Used to wrap your project in to avoid drying out or to put your finished ware in to take home. Drape loosely around your piece to allow wet projects to slowly dry out. Wrap projects tightly to insure ware from drying out and to allow for future work to be done on the piece.



**Paper Towels:**  
These work well for cleaning up messes as well as useful to keep a piece moist. To prevent a piece from drying out over a longer weekend dampen paper towels and wrap around your project before you wrap a plastic bag around.



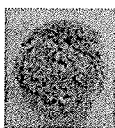
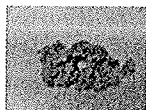
**Water Spray Bottle:**  
This is a useful tool to help keep your project moist. To prevent your project from drying out or to add extra moisture to your piece, spray your project with water, wrap wet paper towels around the piece, and put a plastic bag tightly around the piece.



**Canvas Mat**  
Use this to help keep your project from sticking to the table when rolling out a slab or to keep from cutting the table when cutting clay.



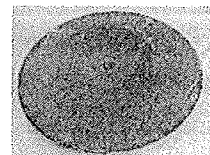
**Sponges:**  
There are many different types of sponges from man made synthetic sponges to natural sponges grown in the ocean. We will use different types of sponges in Ceramics class. Some will more useful in helping with cleaning up, others for wheel throwing or applying glaze.



**Apron:**  
To keep from getting your clothes dirty, put this on over them. It serves multiple purposes.



**Bat:**  
This round plate fits on the wheel head to allow for the potter to throw a pot and easily remove the piece without distorting it.



**Aluminum Modeling Wheel:**  
All-aluminum wheel is excellent for modeling, finishing and decorating. 7" head moves smoothly on a ball bearing. Accurately marked with circles for sizing.



### General Clay Techniques:

**Joining pieces together:** When joining pieces together in the leather-hard clay stage always remember to score (scratch up the surface) and apply slip (watery clay). Pieces may fall off if not properly attached. Make sure to smooth clay all around joined pieces.

When a piece is complete, let the piece slowly dry out to avoid cracking. You may want to cover the piece with a loose plastic bag for a day or so first. Then remove the bag to let it finish drying out.

To prevent warping and pieces from blowing up try to get all areas the same thickness of no more than 1/2 inch. Try to keep from making air pockets as you put clay pieces together. If you are wheel throwing - wedge clay first to get air bubbles out.

If a piece dries out more than you wanted it to, you have a couple options: Either spray the project with water and wrap lots of wet paper towels around the piece for 1-3 days or scrap the project and start again if you don't have days to wait. Make sure you plan ahead, if you want to keep working on a project, keep it wet and wrapped up.

### Cautions

#### Dry Clay in Powder form:

Long-term exposure to the silicates in the dry clay form can settle in your lungs and can cause multiple health problems such as cancer. Take caution to not stir up the clay dust in the air, including blowing clay dust off your bone-dry clay project and shaking clay mats.

#### Broom and Dust Pan:

Clean-up of clay dust or broken projects can be a breeze, don't forget to use these tools. Once done make sure to also use the pink spray cleaner and paper towels to clean your table area to keep all clay dust under control.



### Glaze:

- A liquid suspension of finely ground materials that is applied by brushing, dipping, pouring, sponging, or spraying the surface of a bisque fired ceramic piece. Once done the piece needs to be fired to the temperature at which the glaze ingredients will melt together to form a glassy surface coating. Glazing the surface makes it water tight, adds color, and creates a functional piece you can eat out of. All of the glazed you will be using in Ceramics are lead-free.



### Glazing Procedures- for brushing method:

1. After your piece has been bisque fired sponge clean water on to your piece or rinse out.
2. Shake or stir the glaze you want to use (make sure the lid is on tight).
3. Using a paintbrush or sponge add glaze to your piece. Usually you will need a min. of 1 thick coat or two thin coats, depending on the glaze. Do NOT paint the bottom of the piece or any piece that will be resting on the kiln shelf when firing.
4. When done take a clean sponge and wipe off the bottom to ensure that there isn't any glaze on the bottom.
5. Clean up... Your area and supplies. Put materials back where you got them from. Rinse out all glaze cups and brushes.

### Painting a surface:

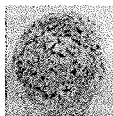
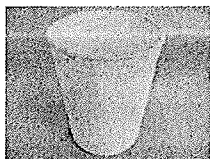
If you would rather paint a surface of a piece instead of glazing, make sure the paint you are using says acrylic. Acrylic paint will be water resistant, but may not withstand heat such as a dishwasher. Acrylic paint works best applied to ware that will be used for decoration purposes such as Christmas tree ornaments or figurines. You will not be able to eat or drink out of a piece that has been painted with acrylic paint.

The advantage of acrylic paint is that you can mix paint color easier and be able to control the end result more. However once a piece has been glazed you may not paint over it with acrylic paint, it will just peel off. Plan accordingly, if you want a piece to be glazed and painted, glazed the areas you want to be glazed first, then once the piece has been fired paint the areas you want to paint last. Do not place a acrylic painted piece in the to be fired area. Paint will burn and make a mess all over your piece.



### Wheel Throwing Tools:

When throwing on the wheel to make a symmetrical pot you can use a variety of tools. The most common tools you will need will be kept in a white bucket: sponge, wooden rib tool, and modeling stick. In addition to these tools, don't forget to use a bat on the wheel head.



### Throwing on the wheel:

- #1 Wedge up a ball of clay, beginners start with a nice clay ball about 1lb.
- #2 Get your supplies out: bat, bucket of water, and wheel throwing tools.
- #3 Place the ball of clay firmly in the center of the wheel bat.
- #4 Add some water to the top of your piece so it slides well your hands. Use water as needed through the whole process.
- #5 Turn on the wheel or start kicking.
- #6 Center the clay on the wheel, squeezing it into the center and down towards the bat. Compress any air bubbles.
- #7 Open up the inside with your thumbs, making a well. Compress the clay towards the bottom until you get about 1/2 inch from the bat. Do not go through your piece.
- #8 Compress the sides slowly with your fingers and make several pulls upward.
- #9 Using the sponge, smooth the form and compress the lip of the piece.
- #10 Use the modeling stick to trim off excess clay around the foot of the piece.
- #11 Write your initials in the clay slip on the bat and place to dry out slowly.
- #12 Clean up your mess! Pour water out of your bucket and clay scraps go in scrap the bucket.
- #13 Wipe down your wheel, tools and bucket. Put back for the next person to use.

